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EXAMINER	
AMIN, JWALANT B	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	**Application No.** 10/691,396	**Applicant(s)** HIGGINS, MICHAEL FRANCIS	
	Examiner JWALANT AMIN	**Art Unit** 2628	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _20 March 2008_.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-8,11-21 and 30-32_ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-8,11-21 and 30-32_ is/are rejected.

7)☒ Claim(s) _32_ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _3/20/2008_.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments with respect to claims 1-8, 11-21 and 30-32 have been considered but are moot in view of the new ground(s) of rejection.

2. Regarding claims 1-8, 11-21 and 30-32, the applicant argues that "... Childs teaches away from the use of non-overlapping regions" (see pg. 12 of applicant's remarks).

3. However, the examiner interprets that Childs teaches dividing said target color space into a set of non-overlapping regions that are bounded by at least two of the at least N+1 target primaries and by said interior color point (Fig. 5, pg. 8 paragraph 4, pgs. 12 and 17-22; dissecting the colour gamut of display corresponds to dividing said target color space; triangles corresponds to regions; formed by sets of three of the display primaries corresponds bounded by at least two of the N+1 primaries; Fig. 5 shows that three triangles are formed comprising two primaries and an imaginary primary G_{3d}, but do not include the interior color point; however it shows how to divide a triangle into non-overlapping regions using two of at least N+1 primaries and a third color point which resides on the boundary of the target color space; it should be noted that Childs teaches that non-overlapping triangles can be used for determining a display color of a point in an image, using a different set of constraints which is more suited to an effective practical implementation requiring a reduced number of non-linear circuit components, which further allows an improvement in image quality and implementation cost, see fig. 5 and pg. 17-22; it should be noted that this approach does not use

overlapping triangles but instead uses non-overlapping triangles as shown in fig. 5). Please refer to the rejection of claim 1 for details.

Claim Objections

4. Claim 32 is objected to because of the following informalities:

5. Regarding claim 32, in the line third from last, the words " said set of coefficients selected" should be changed to "said selected set of coefficients". Appropriate correction is required.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

7. Claims 1-8 and 21 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

8. Regarding claims 1-8, the examiner did not find necessary support in the original disclosure for the words "a set of coefficients stored in a coefficient storage" as described on line 14 of claim 1, and the words "loading said set of coefficients into a multiplier" as described on line 21 of claim 1. It is requested that the applicant provide

any related description in the specification. For the purpose of prior art rejection, it should be noted that the above limitations will be considered.

9. Regarding claim 21, the examiner did not find necessary support in the original disclosure for the words "storage for storing associated coefficients for said conversion matrices" as described on line 16 of claim 21. It is requested that the applicant provide any related description in the specification. For the purpose of prior art rejection, it should be noted that the above limitation will be considered.

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

11. Claims 1-3, 5-8 and 11-13, and 15-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Childs et al. (GB 2282928; hereinafter Childs), in view of Yanagawa et al. (Us 5694186; hereinafter Yanagawa), and further in view of Ito (US 4989079).

12. Regarding claims 1, Childs teaches a method for converting source color points in source image data from a source color space to a target color space, said source color space defined by a combination of N source primary color points, wherein N is an integer (Fig. 4, pg. 12 paragraph 3; four display drive signals correspond to target color space where four corresponds to N+1; three primary transmission system corresponds

to source color space where three corresponds to N; Rs, Gs and Bs corresponds to three primary color points of source color space), the method comprising for the target color space, defining a set of at least N+1 target primaries in which to render said source color points as a combination of said target primaries (Fig. 5, pg. 17 last paragraph; four display colour primaries R_d, G_{1d}, G_{2d}, B_d corresponds to defining a set of N+1 primaries; point D65/colours inside the triangles corresponds to color point rendered as a combination of said primaries); said at least N+1 primaries forming the boundary of the target color space (Fig. 5; R_d, G_{1d}, G_{2d}, B_d form the boundary of the target color space formed by these colors); defining an interior color point (D65, Fig. 5) positioned in the interior of the boundary of said target color space; dividing said target color space into a set of non-overlapping regions that are bounded by at least two of the at least N+1 target primaries and by said interior color point (Fig. 5, pg. 8 paragraph 4, pgs. 12 and 17-22; dissecting the colour gamut of display corresponds to dividing said target color space; triangles corresponds to regions; formed by sets of three of the display primaries corresponds bounded by at least two of the N+1 primaries; Fig. 5 shows that three triangles are formed comprising two primaries and an imaginary primary G_{3d}, but do not include the interior color point; however it shows how to divide a triangle into non-overlapping regions using two of at least N+1 primaries and a third color point which resides on the boundary of the target color space; it should be noted that Childs teaches another solution using different set of constraints which is more suited to an effective practical implementation requiring a reduced number of non-linear circuit components, which further allows an improvement in image quality and

implementation cost, see pg. 17-22; it should be noted that this approach does not use overlapping triangles but instead uses non-overlapping triangles as shown in fig. 5); calculating a solution matrix for each said region, said solution matrix comprising a set of coefficients (pg. 9 last paragraph, pg. 10 3rd paragraph; take sets of three of the display primaries and form a 3 by 3 display matrix corresponds to forming solution matrices for each said region; the separate solutions ... each solution produces drive signals corresponds to calculating solution matrices; it should be noted that the matrices represent the set of coefficient values of the colors); and for a given source color point in said source color space, selecting one of said solution matrices for rendering said source color point in said target color space (Fig. 3, Fig. 5, pg. 10 1st paragraph, pg. 12 4th paragraph; D65/white point corresponds to any given color point; Rs, Gs and Bs system primary signals correspond to source color space; a logic unit ... selects a set for which each pixel has only positive output signals and these respective matrix outputs are input to switches controlled by the logic unit correspond to selecting one of the solution matrices for rendering said source color point with said target primaries), and computing an output color point using said source color point and said set of coefficients (fig. 4, output from the matrix units corresponds to the output color points; solution matrix represents the set of coefficients values of the colors; it should be noted that the solution matrix is used to compute the output color point).

Although Childs teaches the claimed limitations as stated above, Childs does not explicitly disclose that the color space is divided into regions at least two primaries and the interior color point. However, Yanagawa teaches to a triangle with vertices at the

points R', G' and B', which is the gamut of color of reproducible colors, shift toward the point W' (Fig. 2, col. 5 lines 60-67, col. 6 lines 1-12; Fig. 2 shows the primary colors R', G' and B' shift towards the point white W', which is the interior point of triangle formed by R'G'B'; it should be noted that the triangles formed by dividing the color space are non-overlapping regions). Yanagawa further teaches to shift (shift is a form of transformation) R', G' and B' points in the gamut of reproducible colors. The colors in any of triangles R'G'W', R'B'W' and B'G'W' will also shift due to this transformation, changing the hue of those colors to avoid any discontinuities (Fig. 2, col. 5 lines 53-67, col. 6 lines 1-12).

Childs teaches that non-overlapping triangles can be used for determining a display color of a point in an image, using a different set of constraints which is more suited to an effective practical implementation requiring a reduced number of non-linear circuit components, which further allows an improvement in image quality and implementation cost (see fig. 5 and pgs. 17-22). Yanagawa teaches the importance of white point, which is included in the triangle R'G'B', so that when R'G'B' is shifted to the said white point, it produces a narrow gamut of reproducible colors (col. 6 lines 1-12; it should be noted that using an interior point of the color space, more non-overlapping triangles can be formed as compared to using a point on the boundary of the color space). Therefore, a person of ordinary skill has good reason to pursue the option of forming more non-overlapping triangles of Childs by using the white point by shifting those colors. If this leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense. Therefore, it would have been

obvious to one of ordinary skill in art at the time of present invention to try and pursue the known option forming more non-overlapping triangles using the white point, with a reasonable expectation of success.

Although, the combination of Childs and Yanagawa teach the claimed limitations as stated above, they do not explicitly teach to that the set of coefficients of the matrix are stored in a coefficient storage, determining the hue angle of said source color point and using hue angle to select said set of coefficients comprising the solution matrix for the region in which said source color point resides, loading said set of coefficients into a multiplier and use the hue to determine the color correction parameters to avoid discontinuities due to transformation. However, Ito teaches to store the coefficients of the matrix into a coefficient storage and load said set of coefficients into a multiplier (coefficient circuit 129 holds eight combinations of three coefficients that are overwritten or updated as needed, fig. 9, col. 13 lines 5-27; it should be noted that fig. 9 shows that the coefficients stored in the coefficient circuit are loaded into the multipliers to generate the output color). Ito further teaches to calculate the hue (hue angle) of a signal (source color point) on the basis of the density of ratio of three primaries, and based on the hue of the input signal (source color point) it is determined which of the six hue areas (regions) it belongs to (fig. 12, col. 3 lines 7-16, col. 5 lines 2-7, col. 11 lines 55-56, col. 12 lines 1-14, col. 16 table 2 and lines 35-67, col. 17 lines 1-42; it should be noted that each hue area has corresponding masking coefficients, and when a particular hue of a color is selected for adjustments, the corresponding masking coefficients in the area related to that particular hue are also selected for changes). Ito further teaches to

determine hue of RGB input colors for providing the color correction parameters (col. 4 line 1-26; the RGB colors of fig. 12 are analogous to the R'G'B' colors of Yanagawa's fig. 2). Therefore, it would have been obvious to one of ordinary skill in the art at the time of present invention to calculate hue of a color point to determine it's region of location as taught by Ito and apply it into the method of Childs and Yanagawa because calculating the hue on the basis of ratio of spectral densities improves color harmony at the boundary between hue areas (col. 16 lines 38-41).

13. Regarding claim 2, Childs teaches N is 3 (pg. 12 paragraph 4; Rs, Gs and Bs corresponds to three primary color points of source color space where N is 3).

14. Regarding claim 3, Childs teaches interior color point is the white point of the target color space (Fig. 5, pg. 7 lines 1-2; Fig. 5 shows that D65 is the interior point of the target color space; balance point or white point is same as illuminant D65 point).

15. Regarding claim 5, Childs teaches regions are substantially triangles (Fig. 5, pg. 8 paragraph 4; triads/triangles formed by sets of three of the display primaries corresponds to regions are substantially triangles).

16. Regarding claim 6, Childs teaches calculating a matrix that converts between an intermediate color space and the target color space for each said region bounded by at least two primaries and said interior color point (pg. 9, pg. 10 1st paragraph; XYZ corresponds to intermediate color space; real display primaries/display primaries/P1P2P3 corresponds to destination color space with at least three primaries; take sets of three display primaries corresponds to each region bounded by at least three primaries; equations 3e and 3f shows to calculate a matrix that converts between

an intermediate color space XYZ and the destination color space P1P2P3). Please refer to claim 1 regarding the rejection of region bounded by said least two primaries and said interior color point.

17. Regarding claim 7, Childs teaches the intermediate color space is CIE XYZ space (pg. 4 equation 1a, paragraph 2nd from last; X Y and Z are tristimulus values ... CIE 1931 colour space corresponds to intermediate color space is CIE XYZ space).

18. Regarding claim 8, Childs teaches the intermediate color space is the source color space (pg. 10 equation 3g, paragraph 2; tristimulus values of Rs Gs and Bs corresponds to intermediate color space; Rs Gs and Bs corresponds to source color space).

19. Regarding claim 11, Childs teaches an image processing system for converting source color points in source image data from a source color space to a target color space, said source color space defined by a combination of N primary color points, wherein N is an integer, said image processing system comprising a display panel configured to display image data in said target color space and processing circuitry (Fig. 4, pg. 12 4th paragraph; Fig. 4 shows the display device displaying image in target color space of four primaries; decoding circuit corresponds to processing circuitry). Please refer to the statements presented for the rejection of claim 1 for further arguments.

20. Regarding claim 12, the statements presented above, with respect to claims 2 and 11 are incorporated herein.

21. Regarding claim 13, the statements presented above, with respect to claims 3 and 11 are incorporated herein.

22. Regarding claim 15, the statements presented above, with respect to claims 5 and 11 are incorporated herein.

23. Regarding claim 16, the statements presented above, with respect to claims 6 and 11 are incorporated herein.

24. Regarding claim 17, the statements presented above, with respect to claims 7 and 11 are incorporated herein.

25. Regarding claim 18, the statements presented above, with respect to claims 8 and 11 are incorporated herein.

26. Regarding claim 19, Childs teaches the processing circuitry is further configured to determine in which region said source color point resides (Fig. 3, Fig. 5, pg. 10 1st paragraph, pg. 12 4th paragraph; a logic unit ... selects a set for which each pixel has only positive output signals correspond to determining which said region the color point lies in; if the triad of primaries ... display matrix is negative corresponds to point does not reside in that region).

27. Regarding claim 20, Childs teaches all of the claimed limitations as stated above, except he does not explicitly teach to determine the hue angle of said source color point and using hue angle to select the region in which said source color point resides. However, Yanagawa teaches to shift (shift is a form of transformation) R', G' and B' points in the gamut of reproducible colors. The colors in any of triangles R'G'W', R'B'W' and B'G'W' will also shift due to this transformation, changing the hue of those colors to avoid any discontinuities (Fig. 2, col. 5 lines 53-67, col. 6 lines 1-12). Therefore, it would have been obvious to one of ordinary skill in the art at the time of present invention to

shift the colors in the gamut of reproducible colors as taught by Yanagawa and use it into the system of Childs because the degree of shifting the primary colors towards the white displayed in maximum brightness at a viewing angle can be a measure for determining an area of uniform color in the color liquid crystal display device (col. 5 lines 53-67 and col. 6 lines 1-15).

Although, the combination of Childs and Yanagawa teach the claimed limitations as stated above, they do not explicitly teach to determine the hue angle of said source color point and using hue angle to select the region in which said source color point resides, and use the hue to determine the color correction parameters to avoid discontinuities due to transformation. However, Ito teaches to calculate the hue (hue angle) of a signal (source color point) on the basis of the density of ratio of three primaries, and based on the hue of the input signal (source color point) it is determined which of the six hue areas (regions) it belongs to (fig. 12, col. 16 lines 35-67, col. 17 lines 1-42). Ito further teaches to determine hue of RGB input colors for providing the color correction parameters (col. 4 line 1-26; the RGB colors of fig. 12 are analogous to the R'G'B' colors of Yanagawa's fig. 2). Therefore, it would have been obvious to one of ordinary skill in the art at the time of present invention to calculate hue of a color point to determine it's region of location as taught by Ito and apply it into the method of Childs and Yanagawa because calculating the hue on the basis of ratio of spectral densities improves color harmony at the boundary between hue areas (col. 16 lines 38-41).

28. Claims 4 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Childs, Yanagawa and Ito, and further in view of Herbert et al. (US 2004/0111435; hereinafter referred to as Herbert).

29. Regarding claim 4, Childs teaches interior color point is the white point of the target color space (Fig. 5, pg. 7 lines 1-2; Fig. 5 shows that D65 is the interior point of the target color space; balance point or white point is same as illuminant D65 point).

Although the combination of Childs, Yanagawa and Ito disclose all of the claimed limitations as stated above, except that they do not explicitly teach that the interior point is an off-white point. However, Herbert teaches to use an off white point of a lamp's light as the whitest white point of that illuminant ([0025] lines 1-11). Therefore, it would have been obvious to one of ordinary skill in the art at the time of present invention to use an off white point as the white point as taught by Herbert into the system of Childs, Yanagawa and Ito because off white points of different illuminants serves as that illuminants white point by adjusting to that illuminant's surrounding environment ([0025] lines 5-11).

30. Regarding claim 14, the statements presented above, with respect to claims 4 and 11 are incorporated herein.

31. Claim 21 and 30-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Childs, in view of Kasson, and further in view of Ito.

32. Regarding claim 21, Childs teaches a system for converting source image data color points from a source color space to a target color space, wherein said source color

space is defined by N source primary color points and said target color space is defined by at least at least N+1 target primary color points (pg. 12 4th paragraph), said system comprising input means for accepting source image data color points (pg. 12 4th paragraph; transmission system corresponds to input means); a multi-primary converter for image data values from N-primary source color space into image data values for rendering in the at least N+1 primary color space configured for converting said source image data color points from the N-primary source color space into image data values for the at least N+1 primary target color space using one of a plurality of conversion matrices (Fig. 4, pg. 12 4th paragraph; decoding circuit corresponds to multi-primary converter; three primary transmission system corresponds to source image data color points from the N-primary source color space; four primary display device corresponds to image data values for the at least N+1 primary target color space; matrix outputs corresponds to plurality of conversion matrices; matrix outputs are controlled by logic unit of the decoding circuit corresponds to multi-primary converter is further configured to select said conversion matrix). Childs further teaches to select the conversion matrix by determining in which region said source color point resides (Fig. 3-4, Fig. 5, pg. 10 1st paragraph, pg. 12 4th paragraph; a logic unit … selects a set for which each pixel has only positive output signals correspond to determining which said region the color point lies in; if the triad of primaries … display matrix is negative corresponds to point does not reside in that region; solution matrix represents the set of coefficients values of the colors; it should be noted that the solution matrix is used to compute the output color point).

Although Childs discloses all of the claimed limitations as stated above, he does not explicitly teach a hue calculator configured for calculating hue angles for the source image data color points, and a gamut converter configured for optionally fitting the gamut of the source color space to the gamut of said target color space using the calculated hue angles. However, Kasson teaches to compute the hue angle as the arctangent of the ratio of the two chrominance components (Fig. 5, col. 8 lines 58-68), and a gamut converter for optionally fitting (mapping) the gamut of the source color space (out-gamut points) to said target color space (device-dependent gamut) using the calculated hue angles (Fig. 5, col. 8 lines 32-37 and lines 58-68, col. 9 lines 48-65; Fig. 5 shows that the computed hue angles are used to while mapping from out-gamut points to the device-dependent gamut; Kasson teaches to use the hue angles for fitting the gamut of source color space to the target color space, although he does not teach to use the hue angles optionally, but if the hue angles were used optionally then the gamut converter would be fitting the source color space to the target color space with no difference between them, and there would have been no point of converter the source color space into a target color space if it were to remain the same. It would have been obvious to one of ordinary skill in the art at the time of present invention to use hue angles if they intended to change the source space to a target color space, different than the source color space). Therefore, it would have been obvious to one of ordinary skill in the art at the time of present invention to calculate and use hue angles for gamut mapping as taught by Kasson and apply it into the method of Childs because using hue

angles helps luminance variations at low spatial frequencies to which humans are relatively insensitive (col. 8 lines 52-56).

Although the combination of Childs and Kasson teach the claimed limitations as stated above, they do not explicitly teach using the calculated hue angles of the source color point to determine the region in which the source color point resides, and said converter comprises storage for storing associated coefficients for said conversion matrices and a multiplier for calculating an output value based upon said source image data and said associated coefficients of said conversion matrix selected. However, Ito teaches to calculate the hue (hue angle) of a signal (source color point) on the basis of the density of ratio of three primaries, and based on the hue of the input signal (source color point) it is determined which of the six hue areas (regions) it belongs to (fig. 12, col. 3 lines 7-16, col. 5 lines 2-7, col. 11 lines 55-56, col. 12 lines 1-14, col. 16 table 2 and lines 35-67, col. 17 lines 1-42; it should be noted that each hue area has corresponding masking coefficients, and when a particular hue of a color is selected for adjustments, the corresponding masking coefficients in the area related to that particular hue are also selected for changes; Ito teaches to determine the region of the point based on the hue; it should be noted here that Childs as stated teaches to select the conversion matrix by determining in which region said source color point resides using the multi-primary converter (Fig. 3, Fig. 5, pg. 10 1st paragraph, pg. 12 4th paragraph; a logic unit ... selects a set for which each pixel has only positive output signals correspond to determining which said region the color point lies in; if the triad of primaries ... display matrix is negative corresponds to point does not reside in that

region)). Ito further teaches to store the coefficients of the matrix into a coefficient storage and load said set of coefficients into a multiplier to calculate an output value (coefficient circuit 129 holds eight combinations of three coefficients that are overwritten or updated as needed, fig. 9, col. 13 lines 5-27; it should be noted that fig. 9 shows that the coefficients stored in the coefficient circuit are loaded into the multipliers to generate the output color). Therefore, it would have been obvious to one of ordinary skill in the art at the time of present invention to calculate hue of a color point to determine it's region of location as taught by Ito and apply it into the method of Childs and Kasson because calculating the hue on the basis of ratio of spectral densities improves color harmony at the boundary between hue areas (col. 16 lines 38-41).

33. Regarding claim 30, Childs teaches that the multi-primary converter comprises a multiplier configured for multiplying a source image data color point by said conversion matrix to produce an image data value in the at least N+1 primary target color space (Fig. 4, pg. 11 equation 3j, pg. 12 fourth paragraph; matrix arithmetic units correspond to multiplier; display primary drive signals correspond to source image data color point; equation 3j on pg. 11 shows that the image data in four primary target color space (P1-P4) is produced by multiplying the conversion matrix with the display primary drive signals).

34. Regarding claim 31, Childs (figs. 4-5, pg. 12 fourth paragraph) teaches that each conversion matrix (fig. 4 shows three parallel matrix arithmetic units 12, 14 and 16) converts a source image data color point from said source color space (Rs, Gs, and Bs signals) comprising N primary color points (three primary colors) to an image data value

positioned in a region (triads/triangle as shown in fig. 5) in the at least N+1 primary target color space (four display primary drive signals forms the target color space), said region being bounded by at least two of the at least N+1 primary color points of said target color space (the triads of fig. 5 are bounded by at least two of the at least N+1 primary color points).

Although, the combination of Childs and Kasson teach the claimed limitations as stated above, they do not explicitly teach to identify the region of the target image data value by one of said calculated hue angles. However, Ito teaches to calculate the hue (hue angle) of a signal (source color point) on the basis of the density of ratio of three primaries, and based on the hue of the input signal (source color point) it is determined which of the six hue areas (regions) it belongs to (fig. 12, col. 16 lines 35-67, col. 17 lines 1-42). Ito further teaches to determine hue of RGB input colors for providing the color correction parameters (col. 4 line 1-26; the RGB colors of fig. 12 are analogous to the R'G'B' colors of Yanagawa's fig. 2). Therefore, it would have been obvious to one of ordinary skill in the art at the time of present invention to calculate hue of a color point to determine it's region of location as taught by Ito and apply it into the method of Childs and Kasson because calculating the hue on the basis of ratio of spectral densities improves color harmony at the boundary between hue areas (col. 16 lines 38-41).

35. Regarding claim 32, Childs (Figs. 3-5, pg. 12 fourth paragraph) teaches an image processing system for converting an input N-valued color image data in a source color space (Figs. 3-5, pg. 12 fourth paragraph; three system primary signals Rs, Gs and Bs) to an N+1-valued color image data in a target color space (four display primary signals),

said source color space being defined by N primary color points and said target color space being defined by at least N+1 primary color points in said target color space, wherein N is an integer, said image processing system comprising a display (fig. 4) for displaying image data in said target color space defined by said at least N+1 primary color points; and processing circuitry to configured for accepting said input N-valued color image data value, and configured for producing said N+1-valued color image data in said target color space for rendering on display, said processing circuitry being further configured for using said set of coefficients and said source image data in a multiplier to produce said at least N+1 valued color image data value in said target color space (Fig. 4, pg. 12 4th paragraph; decoding circuit corresponds to processing circuitry Fig. 4 shows the display device displaying image in target color space of four primaries; Fig. 4 also shows that three primary colors Rs, Gs and Bs are accepted by the processing circuitry; solution matrix represents the set of coefficients values of the colors; it should be noted that the solution matrix is used to compute the output color point).

Childs further teaches to select the conversion data (conversion matrix) by determining in which region said source color point resides (it should be noted that Child determines the conversion data based on the region of location of the point and not it's hue angle) (Fig. 3, Fig. 5, pg. 10 1st paragraph, pg. 12 4th paragraph; a logic unit ... selects a set for which each pixel has only positive output signals correspond to determining which said region the color point lies in; if the triad of primaries ... display matrix is negative corresponds to point does not reside in that region).

Although Childs discloses all of the claimed limitations as stated above, he does not explicitly teach calculating hue angles for said N-valued color image data value. However, Kasson teaches to compute the hue angle as the arctangent of the ratio of the two chrominance components (Fig. 5, col. 8 lines 58-68), and a gamut converter for optionally fitting (mapping) the gamut of the source color space (out-gamut points) to said target color space (device-dependent gamut) using the calculated hue angles (Fig. 5, col. 8 lines 32-37 and lines 58-68, col. 9 lines 48-65; Fig. 5 shows that the computed hue angles are used to while mapping from out-gamut points to the device-dependent gamut). Therefore, it would have been obvious to one of ordinary skill in the art at the time of present invention to calculate and use hue angles for gamut mapping as taught by Kasson and apply it into the method of Childs because using hue angles helps luminance variations at low spatial frequencies to which humans are relatively insensitive (col. 8 lines 52-56).

Although the combination of Childs and Kasson teach the claimed limitations as stated above, they do not explicitly teach using the calculated hue angles of the source color point to determine the a set of coefficients associated with one of a plurality of solution matrices, in which the source color point resides, and using said selected set of coefficients in a multiplier to produce the output color. However, Ito teaches to calculate the hue (hue angle) of a signal (source color point) on the basis of the density of ratio of three primaries, and based on the hue of the input signal (source color point) it is determined which of the six hue areas (regions) it belongs to (fig. 12, col. 3 lines 7-16, col. 5 lines 2-7, col. 11 lines 55-56, col. 12 lines 1-14, col. 16 table 2 and lines 35-67,

col. 17 lines 1-42; it should be noted that each hue area has corresponding masking coefficients, and when a particular hue of a color is selected for adjustments, the corresponding masking coefficients in the area related to that particular hue are also selected for changes; thus Ito teaches to determine the region of the point based on the hue; it should be noted here that Childs as stated teaches to select the conversion matrix by determining in which region said source color point resides using the multi-primary converter (Fig. 3, Fig. 5, pg. 10 1st paragraph, pg. 12 4th paragraph; a logic unit … selects a set for which each pixel has only positive output signals correspond to determining which said region the color point lies in; if the triad of primaries … display matrix is negative corresponds to point does not reside in that region)). Ito further teaches to store the coefficients of the matrix into a coefficient storage and load said set of coefficients into a multiplier (coefficient circuit 129 holds eight combinations of three coefficients that are overwritten or updated as needed, fig. 9, col. 13 lines 5-27; it should be noted that fig. 9 shows that the coefficients stored in the coefficient circuit are loaded into the multipliers to generate the output color). Therefore, it would have been obvious to one of ordinary skill in the art at the time of present invention to calculate hue of a color point to determine it's region of location as taught by Ito and apply it into the method of Childs and Kasson because calculating the hue on the basis of ratio of spectral densities improves color harmony at the boundary between hue areas (col. 16 lines 38-41).

Conclusion

36. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JWALANT AMIN whose telephone number is (571)272-2455. The examiner can normally be reached on 10:30 a.m. - 7:00 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kee Tung can be reached on 571-272-7794. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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/J. A./
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